

introduction of 10 cc. subcutaneously, and the saline infusion should be repeated every twenty-four hours as long as indicated. Bacelli's carbolic acid treatment is used by the Italians particularly, but has had quite general application. It simply consists in injecting subcutaneously 1 per cent carbolic acid solution, in sufficient quantities so that about five grains of the acid is given an adult during twenty-four hours. Dr. S. A. Matthews has published a method of treatment by a special salt solution that is very effective in experimental animals. He calls it producing cell catharsis. It produces most profound diuresis. The formula is:

| | |
|-----------------------|--------------|
| Sodium chlorid | 55.5 grains |
| Sodium sulphate | 155.0 grains |
| Sodium citrate | 51.0 grains |
| Calcium chlorid | 2.0 grains |
| Water | 2 pints |

This may be injected intravenously very slowly, not over three drams per minute in quantities up to one pint at each infusion, which should be performed twice the first twenty-four hours and once each succeeding twenty-four hours. The profound diuresis that this solution produces must have greater or lesser beneficial effect, and it is probable that the calcium reduces the muscular spasms.

AUTHORITIES:

Journal of the American Medical Association.
Reference "Hand Book of Medical Sciences."
Sajous's "Analytical Cyclopaedia of Practical Medicine."
Therapeutic Gazette.
Medical News.
Osler's "Practice of Medicine."

INNERVATION OF THE HEART AND USE OF CARDIAC STIMULANTS IN TREATMENT OF SHOCK.*

By O. O. WITHERBEE, M. D., Los Angeles.

THE NEED of more satisfactory measures for the care of patients suffering from shock has long been felt by physicians, and an attempt to meet the demands has in many cases been made with, perhaps, as little consideration of the true physiological derangement as is usual in the treatment of the most obscure maladies.

The term "shock" is an expression for a group of clinical symptoms the result of failure of important functions of the body, such as circulation, respiration, excretion and secretion and general metabolism. It is intimately associated with the nervous mechanism. The phenomena of "shock" are complicated, and open a wide field for experimental work. It is not my intention, however, in this article, to discuss a line of experimental research, but rather to cite a few facts; that is, as far as facts may be considered from a physiological standpoint.

It is known that the heart possesses the power of independent pulsation; that its contraction is not effected primarily by nerve energy. The nervous system, however, exercises to a marked degree control of this organ, and it is only under circumstances of an exceptional character wherein the mental or physical condition is violently disturbed that this role of subordination is for a time thrown off. Two important sets of nerves are concerned in the regulation and control of the heart. Those derived from the tenth cranial or pneumogastric exercise an inhibitory influence, while those from the three uppermost ganglia of the sympathetic accelerate the contractions of the heart and, at the same time, augment their force. Physiologists have also undertaken the demonstration of a similar mechanism contained within the heart itself, in the form of the intracardiac ganglia, attributing to these structures the very important function of automatism. The most we could hope to realize from isolated collections of nerve tissue of this character would be reflex action; but here it is evident there is no probability of a complete reflex arc. The transition from the afferent to the efferent fiber of a reflex arc, so far as we know, never takes place in highly organized animals except through a nerve plexus. In the peripheral ganglia the nerve cells appear to give off no branches that form a plexus around them. They seem to be trophic cells

interpolated in the course of the fibers whose nutrition they govern, or stations at which nerve fibers break up for their terminal distribution, not junctions through which impulses may be shunted from one kind of a fiber to another.

The sympathetic ganglion cell may, indeed, have several processes, but one of them is the axis cylinder of a medullated fiber that comes to it from a higher center, and the other the axis cylinders of, it may be, five or six non-medullated fibers passing from it to their destination. Here there is no anatomical foundation for a reflex arc, and the most careful physiological experiments have failed to demonstrate any reflex function in the sympathetic ganglia. Argument in defense of the function of this nerve apparatus of the heart has been presented on the ground that the latter, when removed from the body, or deprived of all the nerves passing to it, still continues to beat for a time, and, in cold-blooded animals, even for a day. Engelman has called attention, however, to the fact that in the foetus pulsation of the heart begins at a period when the latter is still absolutely devoid of nerve cells and, consequently, of nerve fibers. In the human embryo the first beginnings of cardiac ganglia are not found before the end of the fourth or commencement of the fifth week, while Pfluger has seen regular pulsation of the heart in a human embryo of hardly three weeks, which denotes purely a myogenic action entirely independent of any nerve influence.

If, then, we grant the power of independent action on the part of the heart and yet subject it functionally to the control of the nervous system, we must expect to meet with a variety of conditions calling for therapeutic measures in our experience with the derangements of the circulatory apparatus.

Faulty circulation means primarily an incompetent heart, yet the organ in itself may or may not be deficient. Certainly the same remedy will not meet the indication in every instance. If the governing power of the nervous system is for a time withheld, we must temporarily substitute its action as best we may, and endeavor, in some rational manner, to restore its influence. Our line of treatment must depend on the condition to be met, and certainly must vary according to the nature of the derangement we have to overcome. If the centers are merely depressed and not exhausted, stimulation will arouse them. If, however, their excitability is greatly reduced from overstimulation or lack of tone, the result of prolonged or violent irritation, then we may expect that anything short of rest or recuperation will merely intensify the condition, thus leaving our patient in a worse state than we found him.

Direct violence in the vicinity of the solar plexus produces a paralyzing effect which is communicated to auxiliary plexuses, resulting in vasomotor paralysis of all or a greater part of the vessels of the abdomen. In order to compensate for this loss of function, the heart must increase its labor to a very great extent. With pronounced shock to the solar plexus we have paralysis also of the inhibitory nerves. The disastrous results following such a condition are characterized by a heart running at random, wild and erratic, without any control. The organ is then virtually severed from its controlling influence, and to reach it through the nervous system is, for the time being, absolutely futile. When the vasomotor center is exhausted, stimulants such as strychnia (the action of which is confined entirely to the spinal cord) are either valueless or harmful, because if the center is exhausted, strychnia can have no effect, and, if partially exhausted, the stimulation will be followed by a deeper depression.

Shock may be as readily induced by vasomotor stimulants as by injuries or operations; both are stimulants in a way, and neither can be employed with advantage in the treatment of shock produced

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by the other. Alcohol is a depressant. Nitro-glycerine is useful only in certain conditions of the arteries. The vasomotor effect of digitalis is objectionable on the same ground as that of strychnia. As to its direct effect on the heart's action at this time no results are obtained, for when the peripheral resistance is lost, an increase of the heart's action has no effect on the blood pressure. Normal salt solution is not, in any considerable quantity, retained in the blood vessels. If an over-quantity is given, death may be caused by asphyxia, due to accumulation of the solution in the splanchnic area mechanically fixing the diaphragm and the ribs. What then is to be done?

After first settling in our minds the true nature of the derangement, and reasoning, from a physiological standpoint, that to attempt further stimulation of already depressed centers will merely intensify the condition we are seeking to overcome, there remains but one course to pursue. The blood vessels are relaxed, and we cannot control them through the nerve apparatus. Can they be reached by direct stimulation? Crile has resorted to mechanical pressure by means of a pneumatic rubber suit which he has found will give a definite control of the blood pressure from twenty-five to forty millimeters. This creates an artificial peripheral resistance, causing the blood to flow back to the heart regardless of the posture of the patient, and is accompanied by no unfavorable effects. Pneumatic suits cannot always be provided, nor are they always in working order. So we are again confronted by the problem of direct stimulation. Hot salt solution in the abdominal cavity will, in the majority of cases, give very happy results; but sometimes its introduction is followed by a decrease instead of a rise of blood pressure; and while it may act as a local vasomotor stimulant, it has no immediate or direct action on the heart. Something is needed which will affect not only the vessels of the splanchnic area, but also those of the entire vascular system, and at the same time exert a direct action on the fibers of the heart. This must act independently of the nerve apparatus, and the manner of its introduction must be such as will facilitate the least possible delay.

Extracts from the suprarenal gland have met the indications in a larger percentage of cases than any therapeutic agent yet employed. Reichart has shown that it has a direct action on the heart and blood vessels as well as on both the centric and peripheral vasomotor systems. It is also a respiratory stimulant, and increases general metabolism and body temperature. The brilliant experiments of Crile, Martin and others point even more forcibly toward this as a remedy of great importance in the treatment of shock. It is not markedly toxic, and may safely be given far in excess of amounts sufficient to increase blood pressure. This simply accentuates the increase, and is not followed by a compensatory drop. Laboratory experiments show that epinephrin, by intravenous injection, is the most powerful cardiac and vasomotor stimulant yet presented to the profession. Its value also as a respiratory stimulant in the treatment of shock is perhaps of no less importance, while at the same time it increases general metabolism and body temperature. Battelli believes it to be essentially a process of oxidation, and calls attention to the fact that after the blood pressure has returned to normal, following the injection of epinephrin, there is an abundance of the drug to be found in the blood. Carnot has noted that in order to get the same results the dose injected into an artery must be far in excess of the amount injected into a vein; and especially is this true if the muscles to which the artery is distributed are in an exhausted condition. The struggles of an animal when partially under an anesthetic are sufficient to neutralize small doses of the drug. This would indicate that the ef-

fects are transient, and may be manifested more or less imperfectly, depending on the manner of its introduction. Given by the mouth or rectum it is inert so far as its systemic effect is concerned; this is due to the rapid alteration which it undergoes in the body.

Results cannot be expected from doses of less than two cc. of the one-to-one-thousand solution when given by hypodermatic injection, and this should be diluted with at least nine parts of normal salt solution. In urgent cases this strength can be given intravenously, and should be pushed until the heart unmistakably responds to its influence.

REFERENCES.

- Engelman; *Arch. f. die ges. Physiologie*. Bonn 1896-97, Vol. LXV, pp. 535-578.
 Dandurant; *N. Y. Med. Jour.* 1893, Vol. LXXVIII, No. 11.
 Crile; *Jour. Am. Med. Assn.* 1903, Vol. XL, No. IV, pg. 244.
 Martin & Pennington, *Am. Med.* 1903, Vol. VI, No. XXI, pg. 813.
 Battelli; *Soc. de Biol.*, Vol. IV, pg. 815.
 Carnot and Josserand, *ibid.*, Vol. IV, pg. 51.

DISCUSSION.

Dr. C. R. Krone, Oakland.—I am glad to have heard this paper. A year ago I had the pleasure of reading a similar paper before this same society. The paper has not been published in the *STATE JOURNAL*, but I would now like to support in the most powerful way what Dr. Witherbee has said on the use of these stimulants. I would also like to say that there seems to be a peculiar oxidizing process going on. I remember epinephrin solution in an attempt to stop hemorrhage, and the result was that a turbid red blood made its appearance, showing that an oxidation took place. I believe that the administration of normal salt solution and digitalis, etc., has done an enormous amount of harm in cases where it has been pushed, and pushed, and pushed. I find that there are some things that can be given, but digitalis and strychnin and normal salt solution are not medicines of that kind. I feel that perhaps one of the very best things that we can depend upon is the solution of epinephrin chlorid.

Dr. Harry M. Sherman, San Francisco.—The paper of Dr. Witherbee staggered me when I saw the title, because I thought it was going to deal with the heart in a different way. I think none of us who have read the book of Crile have felt anything but dismay. We have had patients with shock, and have injected strychnin, then digitalis, then plenty of alcohol and coffee by rectum, and we have seen a great many patients recover, but we have seen a number die. Looking back at these things in the light of what Crile teaches, we have to appreciate that these patients who recover have practically done so by chance. When I have said this to some men they have said that clinical experience weighed against everything in the book, and that they would continue doing so. I confess that I have seen so many patients die after all this care that I am thoroughly impressed that to give strychnin is to whip an exhausted horse. Practically, we are thrown back upon epinephrin. It is practically the only drug which Crile leaves us. He leaves that because it acts directly upon the muscle wall. I have begun as Crile has suggested, with the saline solution intravenously, putting it in very diluted solution, and the effect has been satisfactory. With regard to the rubber suit, we cannot always have the rubber suit. In one case the other day a child was going into shock and we put on the Martin bandage on the leg; it worked very well. It was shown that the blood pressure came up several millimeters, and the child improved. Then we took off the rubber bandage and the child became worse, so we put it on again. In giving epinephrin there is the possibility of its being an over-stimulant to the heart. For that purpose Crile advises the administration of the therapeutic dose of atropin.

Dr. C. W. Murphy, Los Angeles.—I think one of the most important things is the fact that the action of epinephrin is very transient, and should be quickly repeated.

Dr. S. J. Hunkin, San Francisco.—This idea about the use of epinephrin is all very well, but it does not seem wise to me that it should go out from this society that everything that we have done in the past has been the wrong thing. I believe that too much stimulation in shock is certainly bad. I have seen many patients die even after we have done everything we could to stimulate them; still it has been impressed upon me that salt solution injected into the venous system up to a certain amount revives the patient. I have seen a patient practically dead, and I have seen the color come back and the child get well. Sometimes they only pick up for a time, then die. But there is no doubt in my mind that salt solution did revive the child.

Dr. O. O. Witherbee, Los Angeles.—First of all in this discussion, in bringing out our disappointments in stimulants, we must give reasons, more than I have entered into; physiological reasons why we are many times disappointed in the administration of strychnin. We can get along very well without it. Many times it has been given to the detriment of my patients. I have had my assistants repeat the dose, with no effect. This was before Crile had brought out the facts which he has written. I have used the sphygmomanometer in all my late cases in which I have used epinephrin. With reference to normal salt solution, it is very efficient in some cases, particularly where there is hemorrhage, and sometimes where there is shock. If we have the abdominal cavity open there is no question of its use there. I have noticed that instead of raising the blood pressure, the blood pressure is lowered. We do not expect any medicinal effect from the normal salt solution. There is a difference between the words shock and collapse, as we all ought to understand. Collapse is the early condition which tells us what will follow. Shock is the exhausted condition. We must not mistake collapse for shock. There is no question about overstimulating under these preparations. In some cases we would get the most marked results following the use of strychnin and digitalis, but then our patient was not in shock, but in collapse. That may explain some of our bad results.

OHIO STATE ASSOCIATION ON ADVERTISING.

In resolutions presented early to the house of delegates, and passed unanimously, the Ohio State Medical Association takes a high stand in the matter of advertising in medical journals. Advertisements of patent and proprietary medicines and of preparations whose composition is unknown were declared to be contrary to the principles of medical ethics; and it was further decided that any journal which the association might in future adopt as its official organ should submit its advertising as well as its reading pages to the censorship of the publication committee of the association. The house of delegates further called attention to the advertising pages of the *Journal of the American Medical Association*, and directed its delegates to the meeting of the association next month at Atlantic City to do everything in their power to bring about a change in the advertising material appearing in that journal which would provide for a closer allegiance and a more strict interpretation of the ethics of the profession as applied to medical advertising. — *Cleveland Medical Journal*, June, 1904.

[Note. As we have repeatedly stated, the use of the term "patent medicines" as above is inaccurate. True patent medicines—medicines really patented—are not objectionable for that reason, because everything about them can be learned for the small sum of five cents. What is meant here is an entirely different thing—the nostrum—the "patent medicine" of popular parlance. If the Ohio delegates made any effort to see that a change was brought about in the character of the *Journal A. M. A.* advertising, it was not at all apparent to a close observer in the House of Delegates at Atlantic City!]

DETERMINATION OF THE FUNCTIONAL CAPACITY OF THE KIDNEYS WITH SPECIAL REFERENCE TO KIDNEY-SURGERY.*

By M. KROTOSZYNER, M. D., San Francisco.

SINCE Gustav Simon of Heidelberg, on the 2d of August, 1869, performed the first successful nephrectomy, and since he proved that this organ, considered indispensable to man heretofore, could be removed with subsequent benefit to the patient, surgery of the kidneys and ureters has made unprecedented advances, and may, in its technique, be considered complete and perfect. However, statistics of mortality for nephrectomy, even at the hands of the most experienced operators, are very unsatisfactory. Czerny, for instance, of 33 nephrectomies, lost 51 per cent.; Tuffier, of 8 nephrectomies, 37.5 per cent., and Thornton, of 25 like operations, 20 per cent. These poor results and those published by many others, which are omitted for the sake of brevity, prove that one point was overlooked by all these operators—the condition of the remaining kidney.

Until a few years ago our methods of examination in suspected kidney-lesions, preferably unilateral ones, consisted in:

(a) Inspection, percussion, palpation of both kidney regions, methods that are, to say the least, unsafe and without value to the average physician. Admitted that an artist in the technique of palpation, like James Israel, under favorable conditions can diagnose by palpation a renal neoplasm of the size of a pea; that also by percussion occasionally an enlargement of a kidney may be diagnosed; no careful surgeon will be prepared to operate on the basis of such doubtful diagnostic evidence. Besides that, it is a fact that some kidneys cannot either be palpated or percussed, because they will not descend below the costal arch, even in lean people and under deep respiration.

(b) Radiography. Unfortunately this method does not give satisfactory results, especially for the question whether both kidneys are present or not. It is of value in the presence of renal calculi, but if the Roentgogram does not show anything abnormal, we are not justified in concluding that no pathological condition may exist.

(c) Cystoscopy. This method is at present generally recognized as valuable. It will satisfy us in the majority of instances upon the presence of two ureteral openings and upon the fact that they functionate. But aside from the rare instances where one solitary kidney is connected with two ureters, simple cystoscopy does not decide the all-important question upon the condition of the other kidney. For the fact that the other kidney secretes does not exclude the possibility that it may be absolutely valueless to the organism.

* Read before the San Francisco County Medical Society.